

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) An integrated process for preparation of sulphate of potash (SOP) from bittern comprising:
 - (i) subjecting bittern to fractional crystallization to obtain kainite ~~type~~ mixed salt with high kainite content and MgCl₂-rich end bittern, and subjecting the MgCl₂ ~~MgCl₂~~ rich end bittern to desulphation;
 - (ii) treating the kainite ~~type~~ mixed salt with water and mother liquor obtained in step (xiii) below to leach out substantially all NaCl from the mixed salt and simultaneously convert kainite into schoenite;
 - (iii) filtering the schoenite and separating the filtrate;
 - (iv) desulphating the filtrate with aqueous CaCl₂ to produce gypsum;
 - (v) filtering the gypsum produced in step (iv) and mixing the filtrate with the MgCl₂-rich filtrate obtained in step (vii) below;
 - (vi) evaporating the resultant solution of step (v) and cooling to ambient temperature to crystallize crude carnallite;
 - (vii) centrifuging the crude carnallite and recycling the ~~required quantity, of~~ MgCl₂-rich filtrate to step (v);
 - (viii) decomposing the crude carnallite from step (vi) with appropriate quantity an effective amount of water ~~from step (vi)~~ to yield crude KCl and carnallite decomposed liquor;
 - (ix) filtering the crude KCl, and washing with water to remove adhering MgCl₂ and subjecting to hot leaching for production of muriate of potash (MOP) and NaCl;
 - (x) mixing the carnallite decomposed liquor from step (viii) and washing from step (ix) and treating with hydrated lime to form a slurry;
 - (xi) filtering the slurry and washing the resultant filter cake to produce Mg(OH)₂ and CaCl₂- containing filtrate for the desulphatation process of step (iv);

- (xii) treating by known method the schoenite produced in step (iii) with MOP produced in step (ix) to produce SOP under ambient condition;
 - (xiii) filtering the SOP and collecting separately the mother liquor hereinafter referred to as KEL;
 - (xiv) recycling the KEL of step (xiii) in the process of step (ii).
2. (Currently amended) The A-process as claimed in Claim, 1, wherein the bittern of (i) contains effective amounts of K, Mg and SO₄ in concentrations that make it suitable for kainite production.
3. (Currently amended) The A process as claimed in claim 2 wherein said bittern is selected from the group consisting of sea bittern, and subsoil bittern, and preferably bittern with higher potassium content and which also requires the least evaporation to produce kainite-type mixed salt, and waste bittern sources including such as debrominated bittern effluent.
4. (Currently amended) The A process as claimed in any one of claims 1 to 3 wherein said mixed salt contains KCl-15-22%, NaCl-15-22%, MgSO₄-28-40%, MgCl₂-5-10%.
5. (Currently amended) The A process as claimed in any preceding claim 1 wherein one part by weight of mixed salt is treated with 0.75-1.25 parts by volume of KEL and 0.3-0.7 parts by volume of water.
6. (Currently amended) The A process as claimed in any preceding claim 1 wherein said KEL contains typically 15-17% KCl, 1-3% NaCl, 10-12% MgSO₄, and 2-3% MgCl₂.
7. (Currently amended) The A process as claimed in any preceding claim 1 wherein the SEL contains typically 8-10% KCl, 6-12% NaCl, 12-14% MgSO₄ and 5-7% MgCl₂.
8. (Currently amended) The A process as claimed in any preceding claim 1 wherein the schoenite contains typically 40-45% K₂SO₄, 30-35% MgSO₄ and 0.5-2.0% NaCl.
9. (Currently amended) The A process as claimed in any preceding claim 1 wherein the stoichiometric ratio of CaCl₂ to sulphate for the desulphatation reaction of step (iv) is 1.1:1 to 0.9:1, preferably 1:1.

10. (Currently amended) The A process as claimed in claim 7 wherein 1 part by volume of desulphated SEL was mixed with 0.5-1.5 parts by volume of MgCl₂-rich end bittern of 36-38°Be' (s.g. 1.33-1.38), preferably, 0.7-0.9 parts of end bittern of 37 °Be' (sp. gr. 1,342), and more preferably, MgCl₂-rich end bittern containing no sulphate.
11. (Currently amended) The A process as claimed in any one of claims 1 to 10 wherein the concentration of desulphated SEL to produce carnallite is carried out in a solar pan or in a multiple effect evaporator with simultaneous recovery of water.
12. (Currently amended) The A process as claimed in any preceding claim 1 wherein evaporation is continued till the solution attained a temperature in the range of 120-128°C and more preferably, 122-124°C.
13. (Currently amended) The A process as claimed in any preceding claim 1 wherein the carnallite obtained has 15-20% KCl, 15-20% NaCl and 28-32% MgCl₂.
14. (Currently amended) The A process as claimed in any preceding claim 1 wherein one part by weight of the carnallite is decomposed with 0.4-0.6 parts by volume of water, followed by washing of the cake with a small quantity of water.
15. (Currently amended) The A process as claimed in any preceding claim 1 wherein the molar ratio of active lime to MgCl₂ for production of Mg(OH)₂ and CaCl₂ is in the range of 0.8-1 .0, preferably, 0.90.
16. (Currently amended) The A process as claimed in any preceding claim 1 wherein said Mg(OH)₂ obtained is calcined to produce MgO with 94-98 % purity and with 0.02-0.04 % B₂O₃.
17. (Currently amended) The A process as claimed in any preceding claim 1 wherein the Mg(OH)₂ is used without upgradation for neutralization of acidified de-brominated bittern where such bittern is used as potash source.
18. (Currently amended) The A process as claimed in any preceding claim 1 wherein the MOP obtained upon hot leaching of crude KCl has a purity in the range of 92-98% and NaCl content of 1-5% preferably >95% KCl and <2% NaCl.

19. (Currently amended) The A process as claimed in claims 1-3 wherein the NaCl obtained on hot leaching of crude KCl contains > 97% NaCl.
20. (Currently amended) The A process as claimed in any preceding claim 1 wherein one part by weight of schoenite is treated with 0.3-0.6 parts by weight of MOP and 1-2 pacts by volume of water, and more preferably 0.4 parts by weight of MCP and 1.5 parts by volume of water, in the ambient temperature range of 20-45 degree C.
21. (Currently amended) The A process as claimed in any preceding claim 1 wherein the SOP produced has K₂O content in the range of 50-52% and chloride in the range of 0.5-2.0 %.